

# Controlling stem cells

## **CONTROLLING HUMAN PLURIPOTENT CELLS**

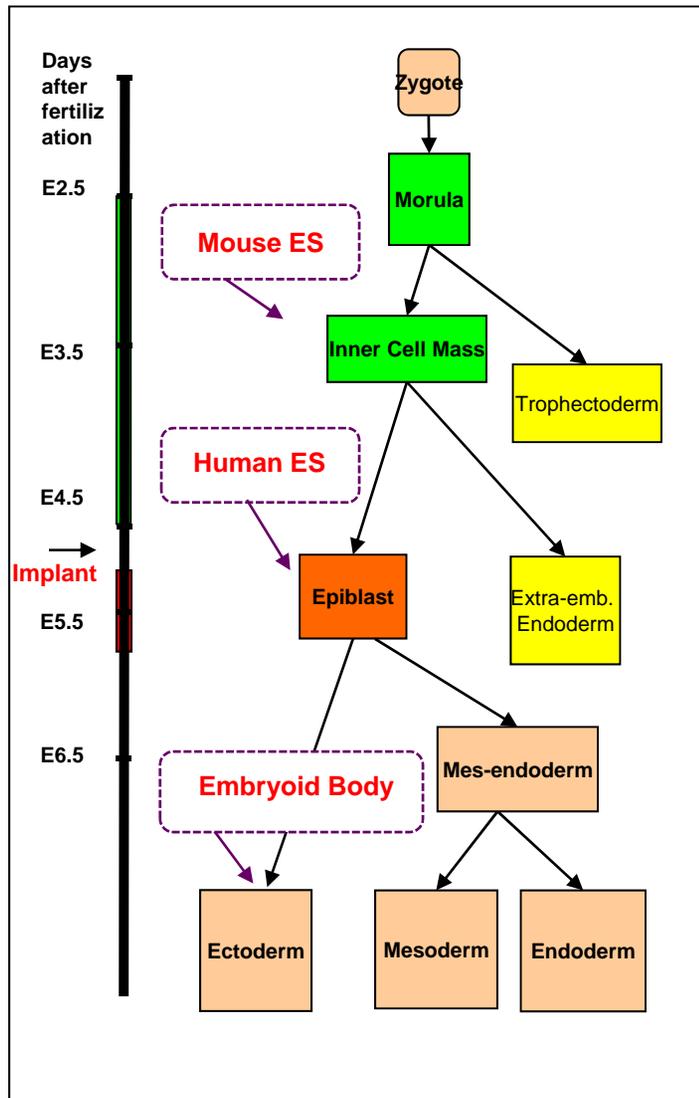
The generation of pluripotent human cells from embryos and adult tissues will be discussed in the context of our growing knowledge of early cell types in mammalian embryos. Data will be presented showing that the growth and in vitro differentiation of human ES and iPS cells can be precisely controlled in vitro.

## **IMPLICATIONS FOR HUMAN GENETICS, REGENERATION AND CANCER**

The precise control of human pluripotent cells allows the differences between lines to be defined. This analysis shows that human pluripotent cells will be powerful new tools to study functional human genetics. Two examples will be used to illustrate how stem cell technologies will advance our understanding of genetic and epigenetic control of gene expression in cancer.

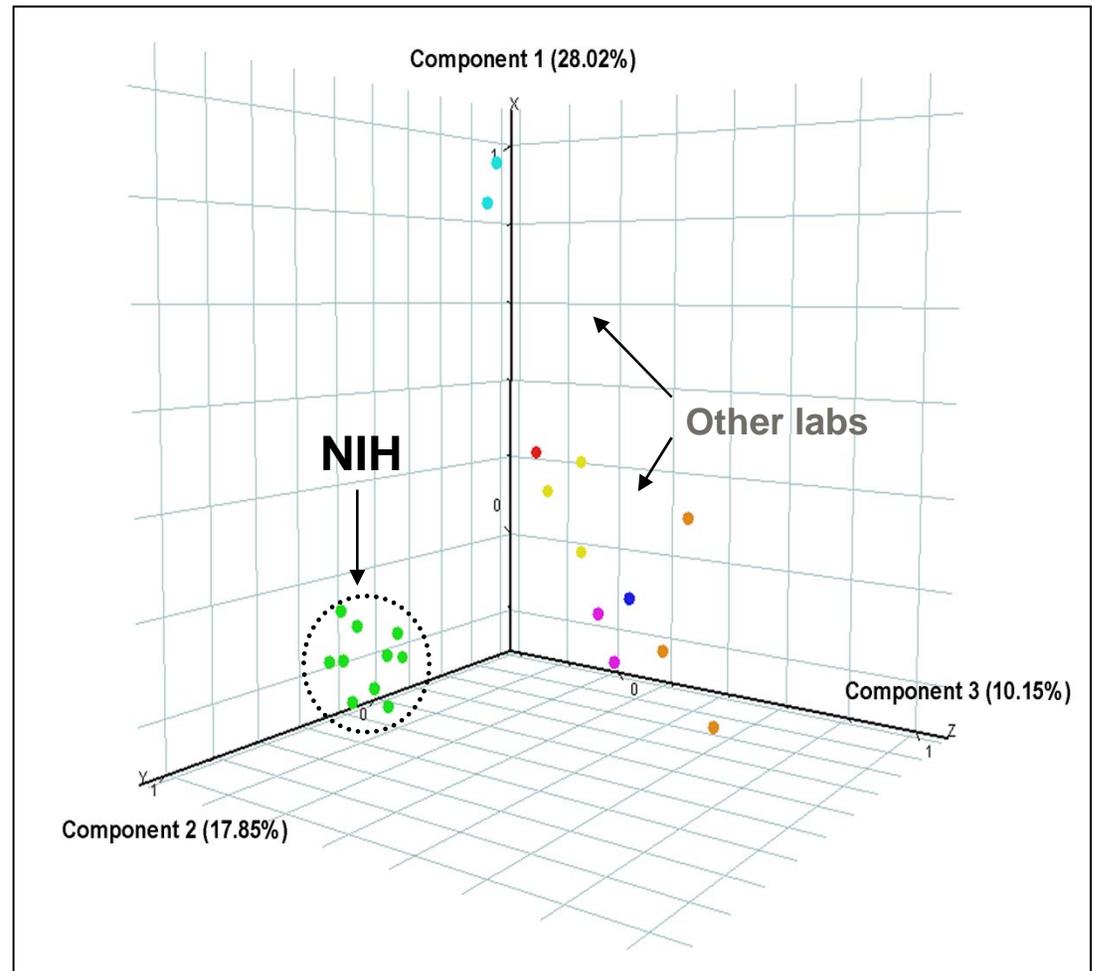
*Josh Chenoweth, Paul Tesar & NIH stem cell facility  
Jong-Hoon Kim and colleagues, Seoul*

## Cell types in the early embryo

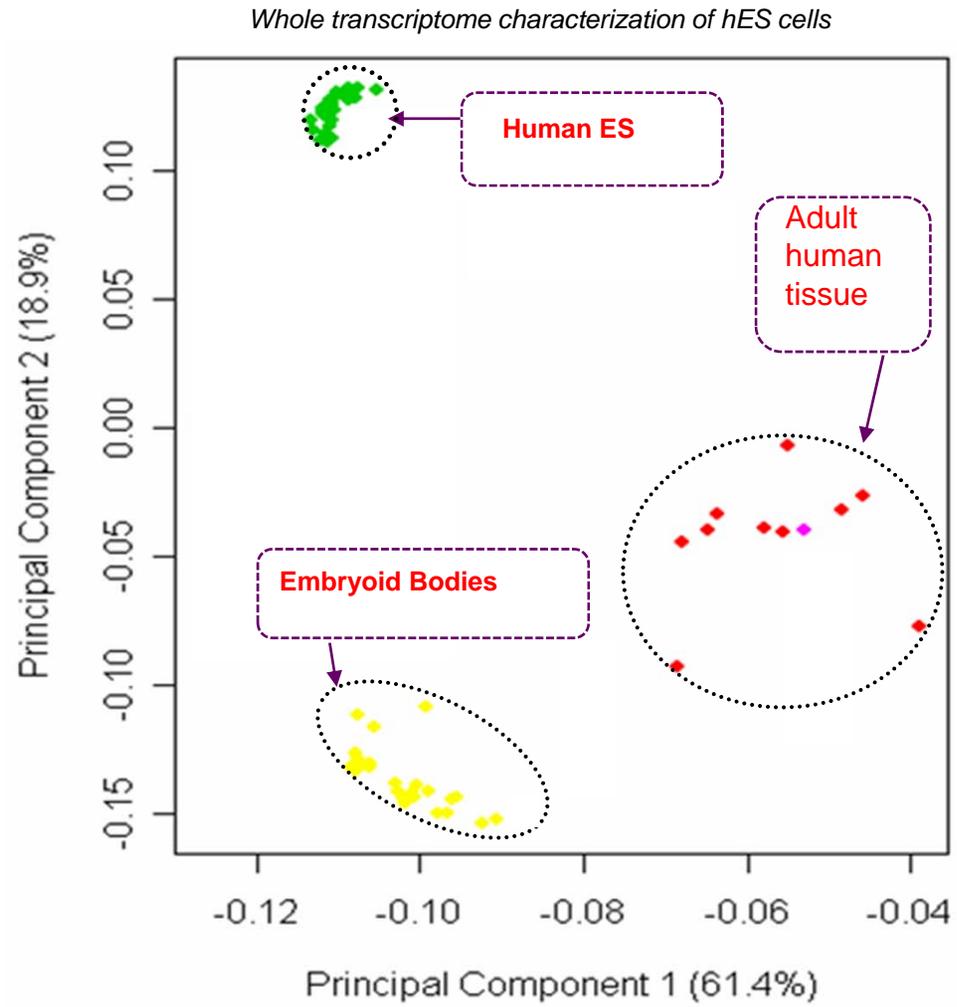


## Controlling human embryonic stem cells

Whole transcriptome characterization of undifferentiated hES cells

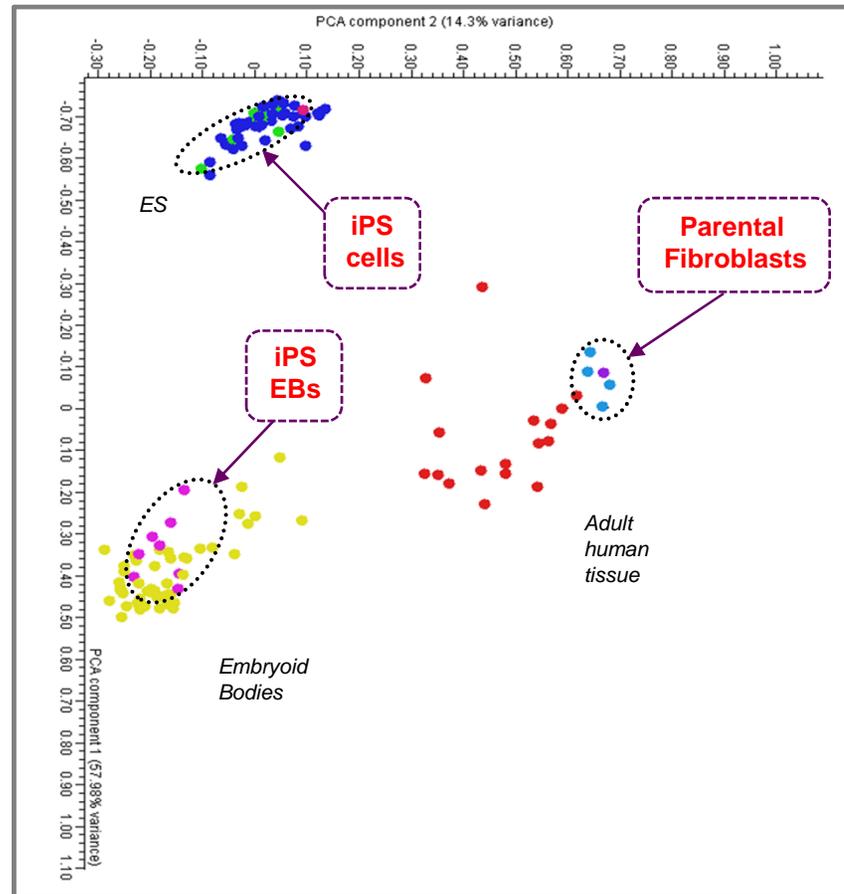


## Controlling differentiation of human embryonic stem cells



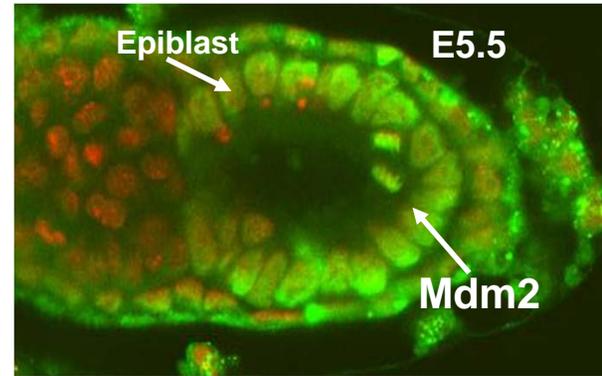
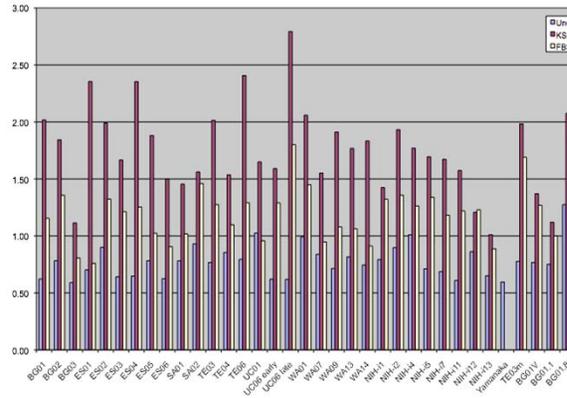
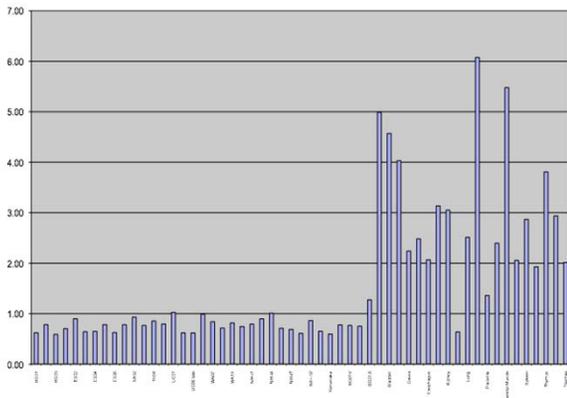
## Controlling differentiation of human iPS cells

Whole transcriptome characterization of hES cells

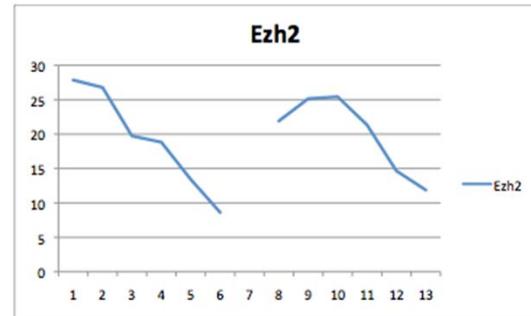
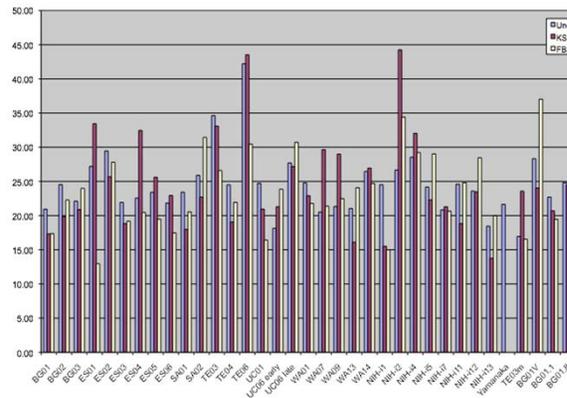
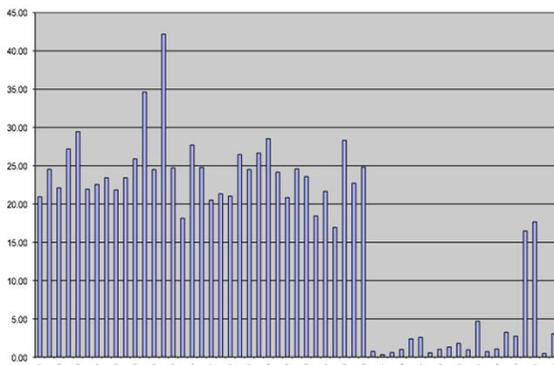


# Defining cancer pathways by controlling human cell states

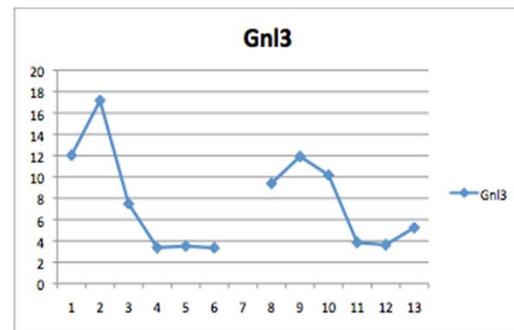
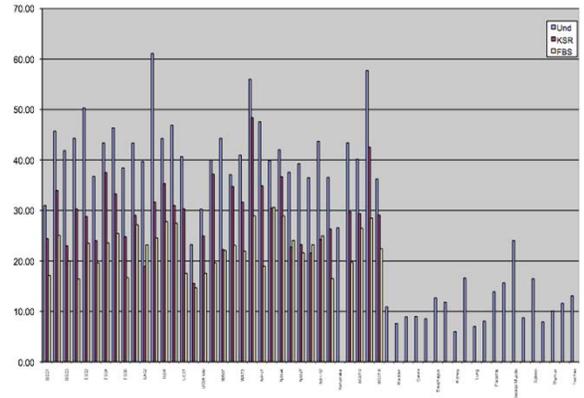
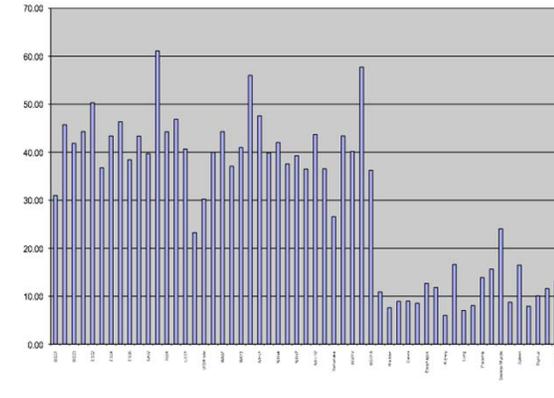
## EZH1



## EZH2

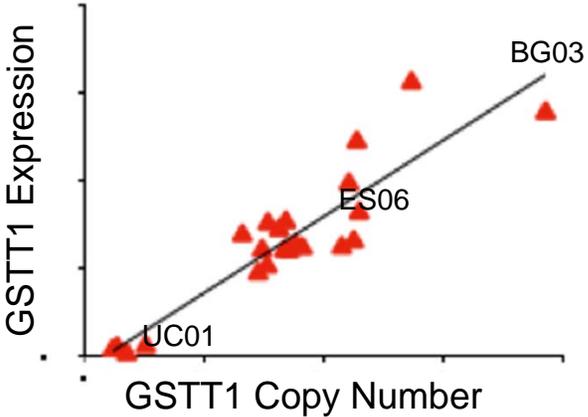
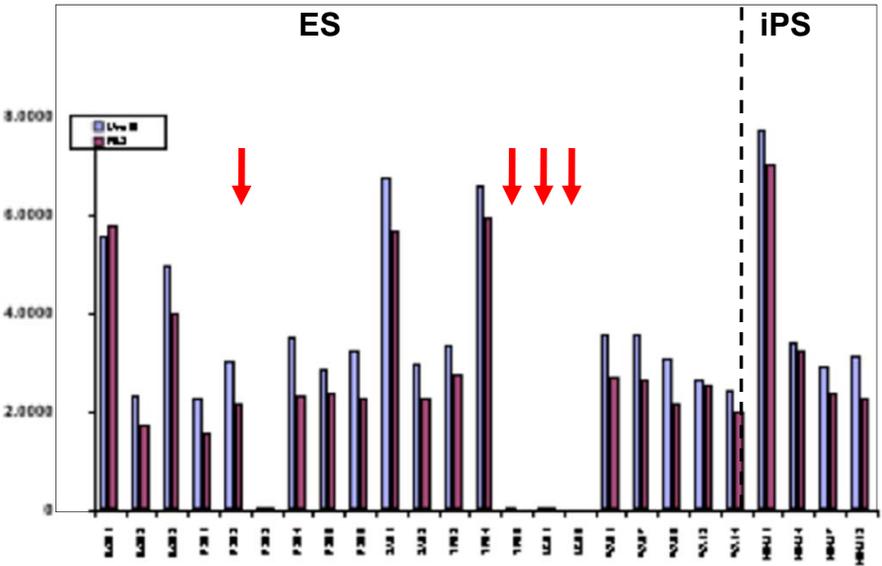


## GNL3

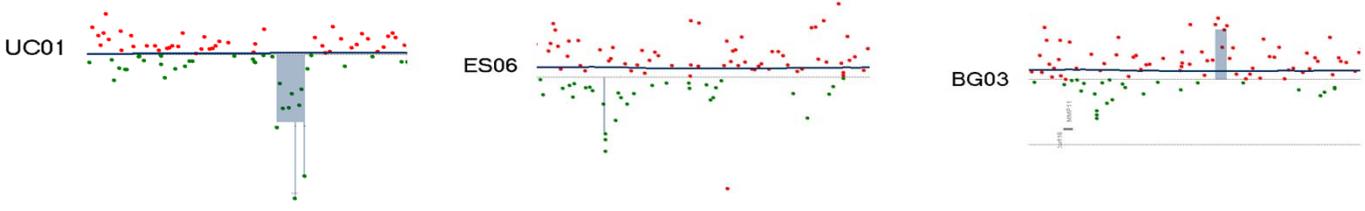


# Polymorphic levels of gene expression – Lung & prostate cancer

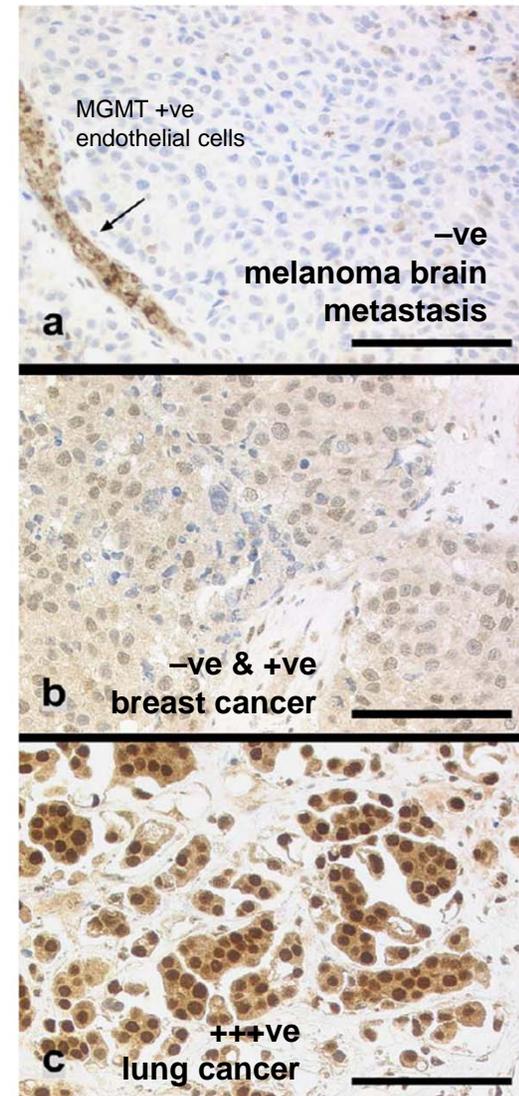
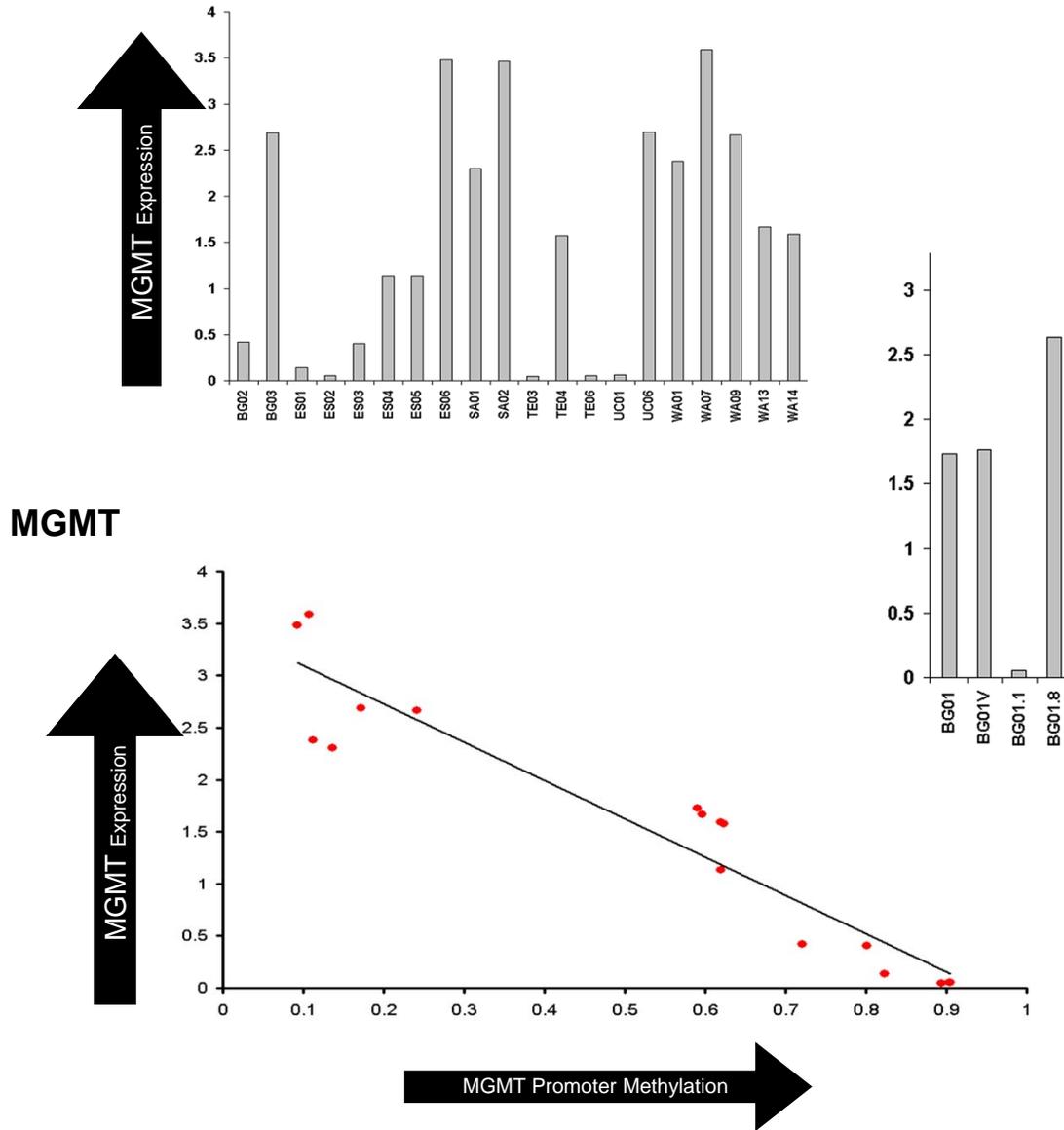
## Glutathione S transferase (GSTT1)



Agilent: CGH Analytics used to assess copy number

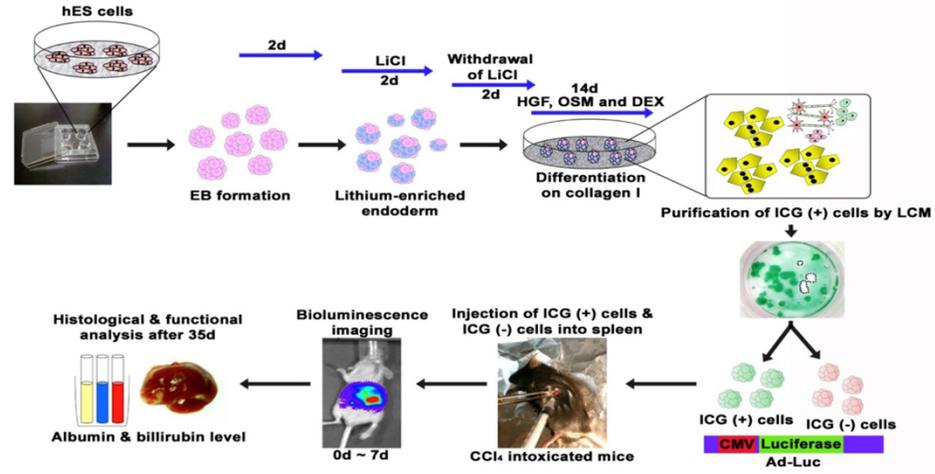


# Polymorphic levels of gene expression – Glioblastoma & Teratocarcinoma

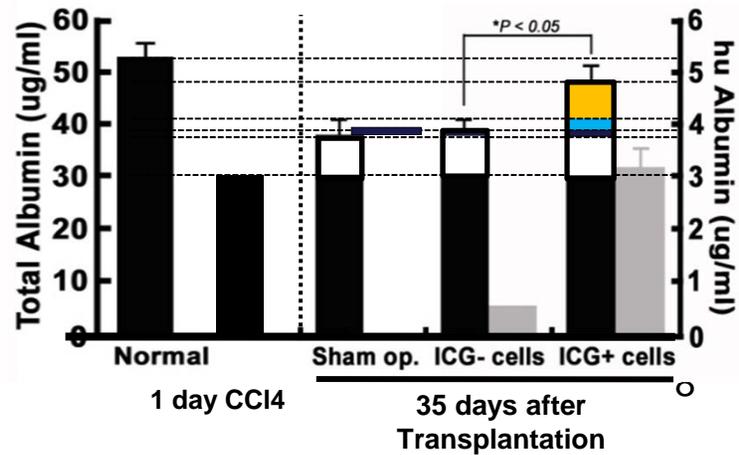
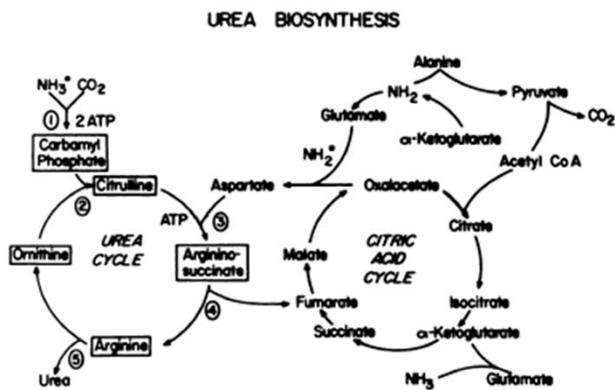
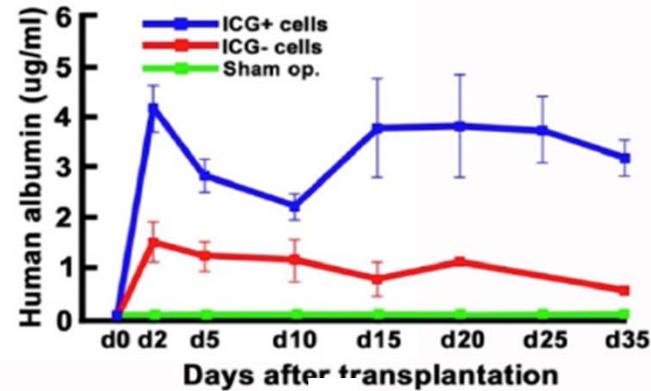
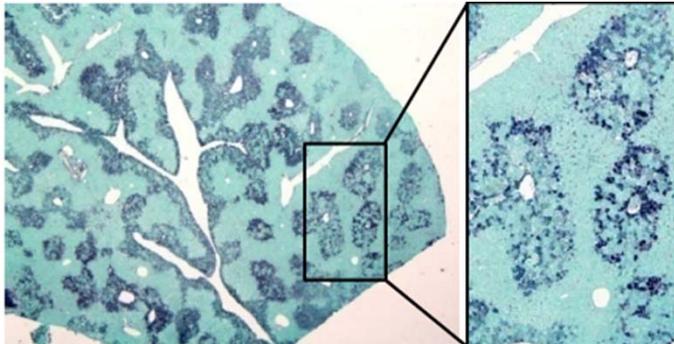


Ingold B, Schraml P, Heppner FL, Moch H, Homogeneous MGMT immunoreactivity correlates with unmethylated MGMT promoter status in brain metastases of various solid tumors PLoS One 2009

# Generating Functional Human Hepatocytes



## Human Albumin



# **Controlling stem cells is opening new strategies to understand & treat cancer**

**CONTROLLING HUMAN PLURIPOTENT CELLS**

**HUMAN GENETICS – CANCER RISK FACTORS, GLIOBLASTOMA & TERATOCARCINOMA**

**TISSUE FUNCTION & REGENERATION**

The rapid advances in stem cell biology will provide the precise understanding of tumor initiation required to develop new targeted therapies for cancer.

These powerful new tools are stimulating a large global investment with important consequences for all areas of medical research.

